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150CT02 E755524-1 D00115
P01/7700 0.00-0223797.2

1. Your reference — **A2690**

2. Patent application number
(the Patent Office will fill in) — 0223797.2

14 OCT 2002

3. Full name of the or of each applicant *(underline all surnames)*

Automotive Products Italia (SV) S.p.A.
Corso Marconi 160
17014 Cairo Montenotte
Savona
Italy

Patents ADP number *(if you know it)*
If the applicant is a corporate body, give the country/state of its incorporation — **Italy**

5696133003

4. Title of the invention — **PARKING BRAKES**

5. Name of your agent *(if you have one)* — **R Morrall**

"Address for service" in the United Kingdom to which all correspondence should be sent

(including the postcode)

Automotive Products Group Ltd
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PO Box 2085
Tachbrook Road
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Warwickshire
CV31 3ZL

Patents ADP number *(if you know it)* — 7619311001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day/month/year)*
GB	**02 21018.5**	**11.09.2002**
GB	**02 21019.3**	**11.09.2002**

7. If this application is divided or otherwise derived from an earlier UK application

Number of earlier application	Date of filing *(day/month/year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
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YES

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Continuation sheets of this form	
Description	11
Claim(s)	4
Abstract	—
Drawings	16 +16

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	*YES*
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature R. Morrall Date 11/10/02

R Morrall - Agent

12. Name and daytime telephone number of person to contact in the United Kingdom **R Morrall 01926 473178**

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A2690GB

PARKING BRAKES

This invention relates to parking brakes.

In the Applicant's earlier UK patent application No. 02 21019.3 there is disclosed a drum-type parking brake in which operation of a parking brake actuating mechanism is used to automatically adjust the shoe clearance of the parking brake when a given amount of movement of the actuating mechanism occurs before the shoes are applied.

The actuating mechanism may be, for example, of the type described in earlier UK patent application No 02 21019.3 in which a parking brake lever is pivotally mounted on one of the shoes and pivoting of this lever via, for example, a cable acts on a strut which acts between the shoes to expand the shoes into contact with the associated drum.

Alternatively, for example, the actuating mechanism may be of the expanding lever type described in the Applicant's earlier published PCT patent application No WO 01/21976A1 or the more recent UK patent application No. 02 03894.1 which may again be operated by, for example, a cable.

In the above parking brakes the cable may be operated manually by, for example, the normal floor mounted lever.

Alternatively the cable may be operated by an electrical actuator, for example, a nut and screw device in which the nut or screw is rotated by an electric motor to shorten effective length of one or more brake actuating cables connected with the actuator.

The Applicant's earlier UK patent application No 02 21019.3 also disclosed a parking brake system comprising an electrical actuator, a drum-type parking brake having a mechanical actuating mechanism for expanding the shoes into contact with the associated drum to operate the parking brake, linkage means connecting the actuating mechanism to the

electrical actuator, and a shoe clearance adjusting device operated automatically in response to movement of the mechanical actuating mechanism to adjust the shoe clearance when the movement of the mechanical operating mechanism required to apply the parking brake exceeds a predetermined distance.

As also disclosed in the Applicant's earlier UK patent application No 02 21019.3 the parking brake and parking brake system of the present invention are particularly applicable to a drum in disc type brake in which the parking brake drum is surrounded by an integrally formed disc on which a separate disc brake operates to provide the service brake function.

An example of the above parking brake system will be described below together with further examples (in addition to those already described in earlier UK patent application No 02 21019.3) of a drum type parking brake with an automatic shoe clearance device operated in response to movement of the mechanical operating mechanism with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic representation of a parking brake system in accordance with the present invention;

Figures 2 to 8 show details of the drum in disc type parking brake used in the system of Figure 1;

Figure 9 shows a view generally corresponding to Figure 6 of a modified form of automatic wear adjuster which includes a bi-metallic pawl;

Figures 10 and 11 show perspective and part sectional views respectively of an alternative automatic wear adjuster;

Figures 12 to 16 show details of a further form of drum in disc type parking brake in accordance with the invention which is also suitable for use in the system of Figure 1;

Figure 17 shows diagrammatically the present invention applied to a single shoe brake, and

Figure 18 shows diagrammatically the parking brake actuating mechanism and automatic wear adjuster of the present invention located between the same ends of a pair of brake shoes.

Referring to Figure 1 this shows a parking brake system in which two drum in disc type parking brakes 10 of the form described in the Applicant's earlier UK patent application No. 02 21019.3 are operated by an electrical actuator 100 under the control of a control system C.

The electrical actuator 100 may take any suitable form and, by way of example only, the actuator 100 illustrated diagrammatically in Figure 1 comprises a screw 101 connected with a brake operating linkage in the form of a cable 103 and a nut 102 connected with a second brake operating linkage in the form of a further cable 104. The nut 102 can be rotated around the screw 101 by a motor 105 via a gear system 106. Thus when the motor is rotated in one direction the screw 101 is moved to the right as viewed in Figure 1 and the nut 102 to the left in Figure 1 this draws the two cables 103 and 104 towards the electrical actuator as indicated by arrows X in Figure 1. Rotation of motor 105 in the opposite direction relaxes cables 103 and 104 to release the brakes. Operation of motor 105 is under the control of control unit C which receives a variety of inputs including an input from a driver operated button 107 positioned on the dashboard or at any other convenient location of the vehicle and various other sensed parameters indicated generally at 108 which the control unit uses as part of its control strategy for operating the motor 105. Since the details of the control strategy of control unit C and the constructional details of the actuator 100 do not form part of the present invention no further details will be given.

Each drum in disc parking brake 10 (see figures 2 to 8) is of the duo servo type and has a pair of shoes 11 and 12 with friction linings 11b and 12b respectively mounted on a backplate 13 with one end of the shoes being pulled against a fixed backplate mounted abutment 14 by return spring 15 and the other end of the shoes pivoting on an automatic wear adjusting means 16 in accordance with the present invention which will be described in more detail

below. Return spring 29 also acts between the lower ends 11c and 12c of brake shoes 11 and 12.

The shoes 11 and 12 are contained within a brake drum indicated diagramatically at 17 in figure 2 which is surrounded by an integrally formed brake disc 17a. The shoes are arranged to be brought into contact with the drum 17 by a mechanical actuating mechanism which comprises a handbrake lever 18 which is pivoted adjacent one end by pin 19 on brake shoe 11. A strut 20 which has forked ends 20a and 20b acts between a first abutment 18a on handbrake lever 18 and a second abutment associated with brake shoe 12 in the form of a plate 22 which is riveted to the shoe 12 at 23 and 24. A biased wedge 21, best seen in Figures 2 and 3, acts between the root 20c of forked end 20b and plate 22.

The biased wedge 21 has one edge 21a which slides down an edge 22a of plate 22 and a further edge 21b which contacts the root 20c of forked end 20b of strut 20. The wedge 21 is biased between the surface 22a and the root 20c by a wire spring 23 which encircles rivet 24 and has one end 23a engaging a slot 24 in wedge 21 and the other end 25 bearing against the inside of the table 12a of brake shoe 12.

This biased wedge arrangement is the subject of the Applicant's earlier UK patent application No. 02 21018.5.

Thus, as will be appreciated, any manufacturing or assembling clearances which may be present between the abutment surface 18a on handbrake lever 18 and the co-operating root 20d of forked end 20a of strut 20 and between the root 20c and the biased wedge 21 are automatically taken up due to the biasing effect of the wire spring 23 so that there is no lost motion in the parking brake actuating mechanism. Thus all pivoting of the handbrake lever 18 relative to the brake shoe 11 by the associated cable 103 or 104 results in immediate movement of the strut 20 and the other brake shoe 12. Also any changes in the size of these contacting components during use of the brake (e.g. caused by Brinnelling due to the high loads imposed) will be taken-up by the biased wedge 21.

As will be appreciated, since the cables 103 and 104 are operated by electric actuator 100 which has a relatively limited operating stroke it is particularly important that all lost motion in the actuating mechanism should be eliminated and this is efficiently and cheaply carried out by the biased wedge 21. It will also be noted that clearances between the strut 20, lever 18 and shoe 12 are multiplied by a factor of approximately 5 at the lower end 18c of lever 18 due to the lever ratio thus making their elimination even more important.

The cables 103 and 104 can be attached to the lower ends 18c of handbrake levers 18 by any suitable arrangement. For example the spring-loaded pivoting latch arrangement disclosed in the Applicant's co-pending PCT application number WO 98/40640 may be employed in which the nipples 27 on cables 103 and 104 are fed into their latched positions shown in Figures 1 and 4 down the centre of a respective guide spring 28 which also acts as a return spring for lever 18.

The automatic wear adjusting means 16 of each brake will now be described in detail.

The wear adjusting means 16 of the present invention essentially comprises a variable length strut 30 in the form of a first strut member 31 having a diametrical slot 31a which receives the lower end 11c of brake shoe 11 and which has a screw threaded portion 31b which is threadably received in a toothed ratchet wheel 32. Screw threaded portion 31b of strut member 31 is received with clearance in a bore 33 of a strut member 34 which also has a diametral slot 34a which receives the lower end 12c of shoe 12. Thus the strut members 31 and 34 are held against rotational movement relative to the shoes 11 and 12 respectively and the effective total length of the strut 30 can be varied by screwing the ratchet wheel 32 along the screw threaded portion 31b of strut member 31 since strut member 34 reacts against the right hand side of ratchet wheel 32.

Thus in order to compensate for the wear of the linings 11b and 12b of shoes 11 and 12 it is simply necessary to rotate the ratchet wheel 32 to displace the lowers ends 11c and 12c of the shoes 11 and 12 away from each other to compensate for lining wear.

This adjustment of the effective length of the variable length strut 30 is made automatically in response to the increasing movement of handbrake lever 18 relative to shoe 11 as the shoes wear. This increased movement is sensed by an adjusting lever 35 which is pivoted on shoe 11 by rivet 36. Adjusting lever 35 includes a follower 37 which is contacted by the lower edge 18d of lever 18 when the handbrake is applied by cable 103,104 and a pawl 38 which contacts the teeth of ratchet wheel 32. As will be appreciated, as the brake linings 11b and 12b wear the movement of lever 18 necessary to apply the parking brake will increase so that the lower edge 18d of lever 18 will move further to the right as viewed in Figure 5. This movement of the lower edge of lever 18d causes follower 37 to pivot the adjusting lever 35 about rivet 36 in a clock-wise sense (see arrow P) as viewed in Figure 5 (counter clock-wise as viewed in Figures 6 and 7) to move the pawl 38 on lever 35 up and down the tooth 32a which the pawl currently engages. Each time the handbrake lever is released and the lower edge 18d moves back out of contact with follower 37 the adjusting lever 35 is pivoted back clockwise as viewed in Figures 4 and 5 about pivot 36 by a bias spring 39 until a stop surface 35a contacts the table 11a of shoe 11.

Eventually the movement the follower 37 by the lower edge 18d of lever 18 results in sufficient movement of the pawl 38 up the contacting ratchet wheel tooth 32a to cause the pawl to slide over the top of tooth 32a to engage the next tooth 32b of the ratchet wheel. Figure 8 shows the pawl 38 about to pass over the top of tooth 32a to engage tooth 32b. On the next retraction of the lever 18 following the engagement of the new tooth 32b the bias spring 39 rotates the ratchet wheel 32 anticlockwise (as viewed in Figure 7 or 8) thus increasing the effective length of strut 30 to adjust for the wear of the shoe linings 11b and 12b which has occurred.

As will be appreciated the above parking brake system includes a simple but effective means of continually adjusting for the wear of the linings 11b and 12b of the brake shoes. This ensures that the free travel before the brake shoes contact the associated drum 17 is kept to a minimum which is of particular advantage when the parking brake is actuated electrically, as discussed earlier, since such electrically actuation systems tend to have relatively limited travel.

The parking brake 10 with its automatic wear adjuster 16 is also suitable for manual operation via, for example, a cable operated by a conventional driver operated lever.

Such an arrangement is a considerable improvement on current parking brake arrangements which require manual adjustment of the parking brake function which inevitably leads to the parking brake becoming less effective than desirable between the normal service intervals of the vehicle.

Figure 9 shows a modification of the arrangement shown in figures 2 to 8 in which the pawl 38 formed integrally with adjusting lever 35 is replaced by a bi-metal pawl 40 arranged so that should the general temperature of the parking brake become excessively high (which might lead to over adjustment of the clearances etc.) the bi-metal pawl will tend to bend away from the ratchet wheel teeth thus disengaging the teeth and preventing any adjustment of the effective length of strut 30 until the temperature of the brake has fallen to a level at which the bi-metal element once again engages the ratchet wheel teeth.

Figures 10 and 11 show an alternative arrangement in which instead of using the bias spring 39 to provide the motive force for rotating the ratchet wheel 32 the teeth on ratchet wheel 32 are reversed so that the movement of the handbrake lever 18 and its co-operation with the follower 37 is arranged to pivot the adjusting lever 35 anti-clockwise about the rivet 36 when viewed in Figure 10 thus causing the end of pawl 38 to contact the root portion 32c of tooth 32a and thus rotate the ratchet wheel 32 slightly in a clockwise sense as viewed in Figures 10 and 11. Thus each time the lower edge 18d of handbrake lever 18 moves up follower 37 there is a tendency for the ratchet wheel 32 to be rotated slightly in a clockwise sense if any wear of the associated brake shoes has taken place. On each retraction of the handbrake lever 18 the spring 39 draws the end of pawl 38 up the ramp 32d of the next tooth 32b as the adjusting lever 35 is moved back so that its stop surface 35a contacts the table 11a of shoe 11. Eventually the clockwise rotation of the ratchet wheel resulting from and the coaction of the lower edge 18d of lever 18 and follower 37 will have rotated the ratchet wheel 32 sufficiently clockwise as viewed in Figures 10 and 11 so that, on retraction of the adjusting lever 35 by

spring 39, the end of pawl 38 rides over the tip 32e of tooth 32b and engages the root 32f of the next tooth 32b. Thus there is a continuous small rotation of ratchet wheel 32 as the associated brake shoes 11 and 12 wear.

In the arrangement shown in Figures 10 and 11 the pawl 38 is of a bi-metallic construction, similar to that shown in Figure 9, which is riveted to the adjusting lever 35 and which will disengage the teeth of ratchet wheel 32 if the temperature of the parking brake becomes excessive in order to prevent over adjustment of the effective length of strut 30.

Although in the constructions described above a biased wedge adjusting arrangement in accordance with the Applicant's earlier UK patent application No 02 21018.5 has been described in use in connection with strut 20, it will be understood that the automatic wear adjusting means 16 of the present invention which is located between the lower ends 11c and 12c of the shoes 11 and 12 may be used without such a biased wedging arrangement when the elimination of clearances in the strut actuating mechanism is less essential.

As will be appreciated, the inclination of the lower edge 18d of lever 18 which is contacted by follower 37 may be varied to adjust the amount of pivoting of adjusting lever 35 corresponding to a given amount of movement of lever 18. Also, the follower 37 could be replaced by a cam formation on plate 35 for cooperation with lever 18 to again produce a particular relationship between the pivoting of adjusting lever 35 and handbrake lever 18.

Figures 12 to 16 show an alternative form of parking brake in accordance with the present invention which uses an expanding lever actuating mechanism 200 similar to that described in the Applicant's co-pending published PCT patent application No. WO 01/21976A1 and the Applicant's earlier UK patent application No. 02 03894.1.

This expander mechanism 200 is positioned between the upper ends of brake shoes 11 and 12 and comprises a first lever 211 having a first contact zone 212 for engagement with a web of an associated brake shoe 11 and a second lever 215 having a second contact zone 216 for engagement with the web of a second brake shoe 12. The two levers 211 and 215 are

pivotally interconnected at 219 so that, in conventional manner, pivoting of first lever in direction P1 results in an increase in the distance between the first and second contact zones 212 and 216 to force the brake shoe 11 and 12 apart causing them to engage with an associated drum in disc (not shown). As is conventional, the brake includes return springs 220 and 29 which act between the shoes and an automatic adjustment device 16 generally of the form described above in relation to Figures 2 to 8 is located between the lower ends 11c and 12c of the brake shoes.

The shoes 11 and 12 are mounted on a back plate 213 which includes an aperture 224 through which a parking brake actuating cable 225 extends. The cable has an outer sheath 226 which is gripped in aperture 224 and an inner member 227 whose free end terminates in a nipple 228. As can be seen from figures 14 to 16, first lever 211 is of hollow pressed metal form and includes a longitudinally extending passage 229 whose cross section includes a wider portion 230(see Fig 16) through which the nipple 228 can pass and a narrower portion 231 through which the nipple cannot pass. As shown in figure 15, the inner 227 of the cable can be threaded through the wider portion 230 of passage 229.

A leaf spring 240 is mounted on lever 211 in a notch 241 by clip portion 242 and tabs 243. Spring 240 includes a cam portion 244 which is contacted by the nipple 228 as the nipple emerges from the passage 229 and which tends to deflect the nipple 228 towards a fully installed position shown in Figure 15 in which a shoulder 233 of nipple 228 contacts an end 231a of the narrow portion 231 of passage 229 when the cable inner 227 is drawn in direction Z of figure 16 so that the first lever 211 is pivoted in direction P1 and hence the actuating mechanism is operated. End 231a of narrow passage portion 231 forms the abutment formation of lever 211.

The expander mechanism 200 is connected with the automatic adjusting device 16 by a link and bell crank arrangement shown in figures 12 and 13. This link and bell crank arrangement which comprises link 250 directly connected with lever 211, bell crank 251 pivoted on the brake backplate about an axis 252, further links 253 and 254 and an intermediate connecting bell crank 255 which is again pivoted on a brake backplate about an axis 256. The final link

254 is connected with adjusting lever 35 so that pivoting of lever 211 in direction P1 is translated into downward movement of adjusting lever 35 as indicated by arrow S in figure 13.

Thus as described in relation to figures 2 to 8, when the pivotal movement P1 of lever 211 exceeds a pre-determined amount there is sufficient vertical movement S of adjusting lever 35 to ride over onto the next tooth 32b on ratchet wheel 32. Thus again the wear of linings 11b and 12b of shoes 11 and 12 is automatically adjusted when the movement of the handbrake actuating mechanism necessary to apply the handbrake exceeds a pre-determined distance.

The automatically adjusting parking brake described in figures 12 to 16 may be manually actuated by cable 225 or this cable may be electrically operated when the parking brake described in figures 12 to 16 is used as part of a parking brake system as shown in figure 1.

The automatically adjusting parking brake concept of the present invention in which movement of the parking brake actuating mechanism beyond a pre-determined distance is used to effect adjustment of the brake shoe clearance may be implemented by locating both the handbrake actuating mechanism and the automatic wear adjuster at the same end of the brake shoe of shoes.

Thus, for example, as shown diagrammatically in Figure 17 in a single shoe drum brake of the type, for example, disclosed in EP 392829A1 and WO99/53212 both the parking brake actuating mechanism 300 and the automatic wear adjuster 316 may be located between the free ends 311a of a single curved brake shoe 311.

Similarly, as shown diagrammatically in Figure 18, in a two shoe brake with a fixed or floating abutment 414 located between the lower ends of brakes shoes 411 and 412 the parking brake actuating mechanism 400 and automatic wear adjuster 416 may be located between the upper ends 411a and 412a of the shoes.

In both of the arrangements described above in relation to Figures 17 and 18 movement, for example, of part of the parking brake actuating mechanism in direction R could be used to pivot an adjuster lever similar to adjuster lever 35 described above in relation to Figures 5 to 8 to move a pawl similar to pawl 38 to rotate a ratchet wheel 332 or 432 respectively.

Thus the present invention provides both a drum type parking brake in which operation of a parking brake actuating mechanism is used to automatically adjust the shoe clearance of the parking brake when a given amount of movement of the actuating mechanism occurs before the shoes are applied and also a parking brake system in which an electrical actuator operates a drum type parking brake with an automatic adjuster as described above.

CLAIMS

1. A drum type parking brake comprising one or more brake shoes, a parking brake actuating mechanism for bringing the shoe or shoes into contact with an associated drum, and an automatic adjusting means actuated when the movement of the actuating mechanism required to bring the shoe or shoes into contact with the drum exceeds a predetermined distance.

2. A drum in disc type brake comprising a brake drum surrounded by an integrally formed brake disc, one or more brake shoes, a parking brake actuating mechanism for bringing the shoe or shoes into contact with the brake drum, and an automatic adjusting means actuated when the movement of the actuating mechanism required to bring the shoe or shoes into contact with the brake drum exceeds a predetermined distance.

3. A parking brake according to claim 1 or 2 having a pair of brake shoes and in which the actuating mechanism comprises a handbrake lever pivoted adjacent one end of one of the shoes, and a strut extending between a first abutment on the handbrake lever and a second abutment on the other brake shoe so that pivoting of the handbrake lever relative to said one shoe moves the strut which in turn moves the other shoe away from said one shoe to bring the shoes into contact with the drum and thus apply the parking brake, the automatic adjusting means being provided between the ends of the shoes remote from the strut, the adjusting means being actuated by pivoting movement of the handbrake lever relative to said one shoe beyond a predetermined distance to increase the effective length of the adjusting means thus moving the ends of the shoes apart to compensate for wear of the shoes.

4. A parking brake according to claim 3 in which a biased wedging means acts between the strut and one of the first or second abutments to take up play in the thrust path between the handbrake lever and the other brake shoe via the strut.

5. A parking brake according to claim 4 in which the second abutment comprises a plate secured to the web of the other shoe and having a surface along which an edge of the biased wedge can slide, a further edge of the wedge sliding along a further abutment surface on the strut.

6. A parking brake according to claim 5 in which the further abutment surface on the strut comprises the root of a forked end portion of the strut, the forked end having two prongs which extend on opposite sides of a web of the other brake shoe.

7. A parking brake according to claim 1 or 2 having a pair of brake shoes and in which the actuating mechanism comprises a first lever having a first contact zone adapted to engage a portion of a first brake shoe, said first lever being pivotally connected with a second lever, the second lever having a second contact zone adapted to engage a portion of a second brake shoe, pivoting of the first lever relative to the second lever being arranged to increase the effective length of the mechanism between the contact zones thus moving the associated brake shoe portions apart to engage the parking brake, automatic adjusting means being provided between the ends of the shoes remote from the first and second levers, the adjusting means being actuated by movement of one of the levers beyond a predetermined distance to increase the effective length of the adjusting means thus moving the ends of the shoes apart to compensate for wear of the shoes.

8. A parking brake according to any one of claims 1 to 7 in which the automatic adjustment means includes a screw-threaded device which is rotated to increase its effective length by a pawl and toothed ratchet wheel operated in response to movement of the actuating mechanism.

9. A parking brake according to claim 8 in which the movement of the actuating mechanism to apply the brake causes the pawl to move up and down a ratchet wheel tooth with which it is currently engaged so that when the movement of the actuating mechanism exceeds a predetermined distance (indicating a predetermined amount of wear of the shoes) the movement of the pawl is sufficient to engage the next tooth on the ratchet wheel so that during the next release of the brake the pawl rotates the ratchet wheel under the action of a bias force to increase the effective length of the adjusting means and hence move the shoes further apart.

10. A parking brake according to claim 8 in which the movement of the actuating mechanism causes the pawl to push on the root of a ratchet wheel tooth to tend to rotate the ratchet wheel to take up wear of the shoes, the pawl being retracted relative to the ratchet wheel on each brake release, and the arrangement being such that when retraction of the pawl exceeds a predetermined amount, indicating the presence of a predetermined amount of wear of the shoes, the pawl snaps into the root of the next ratchet wheel tooth and the adjustment process is repeated..

11. A parking brake according to claim 9 or 10 when dependent on claim 3 in which the pawl is mounted on a pivotally mounted adjuster plate, the adjuster plate being pivoted to move the pawl in response to contact of the adjuster plate by the handbrake lever.

12. A parking brake according to claim 9 or 10 when dependent on claim 4 in which the pawl is mounted on a pivotally mounted adjuster plate, the adjuster plate being pivoted to move the pawl via a linkage connected with the first or second lever.

13. A parking brake according to any one of claims 8 to 11 in which the pawl is of a bi-metallic construction so that should the temperature of the brake become excessively high (which might lead to an over adjustment of the brake) the pawl is deflected out of engagement with the ratchet wheel tooth to prevent adjustment of the effective length of the adjusting means.

14. A parking brake system comprising an electrical actuator, a drum-type parking brake having a mechanical actuating mechanism for expanding a pair of shoes into contact with an associated drum to operate the parking brake, linkage means connecting the actuating mechanism to the electrical actuator, and a shoe clearance adjusting device operated automatically in response to movement of the mechanical actuating mechanism to adjust the shoe clearance when the movement of the mechanical operating mechanism required to apply the parking brake exceeds a predetermined distance.

15. A system according to claim 14 which uses a parking brake according to any one of claims 1 to 13.

16. A parking brake constructed and arranged substantially as hereinbefore described with reference to and as shown in Figures 2 to 8 or 9 or 10 and 11 or 12 to 16 or 17 or 18 of the accompanying drawings.

17. A parking brake system constructed and arranged substantially as shown in Figure 1 of the accompanying drawings.

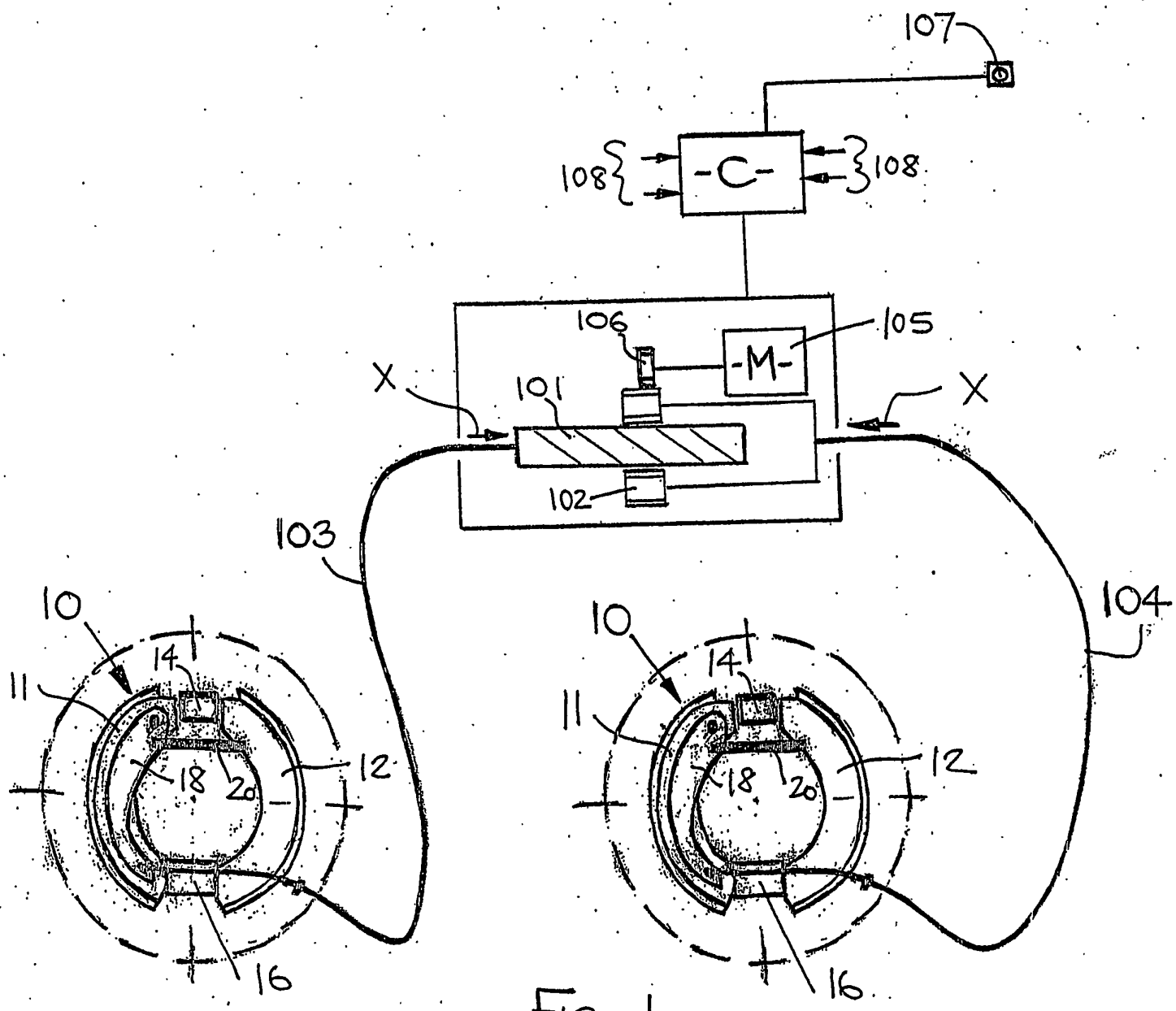
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FIG. 1.

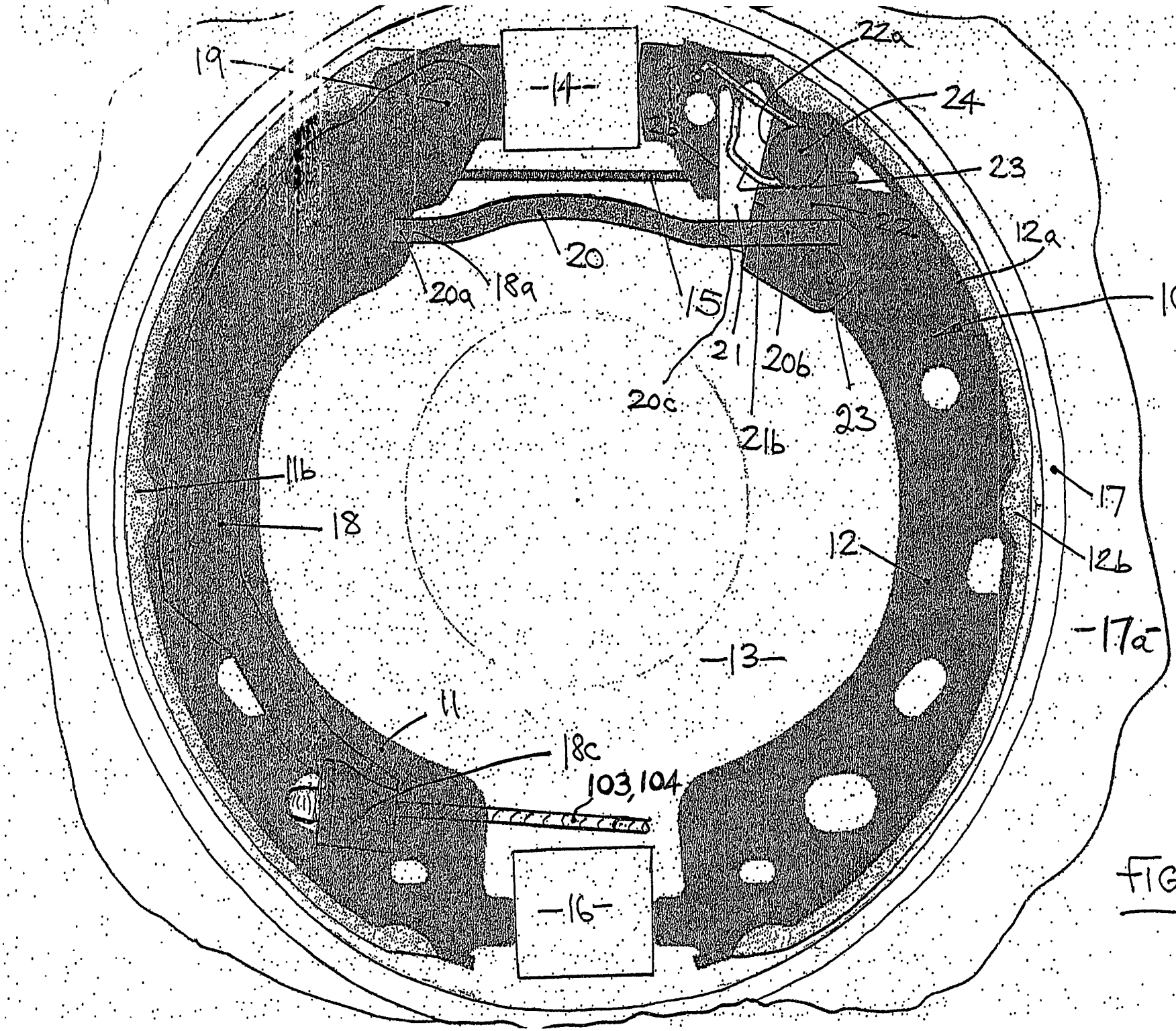
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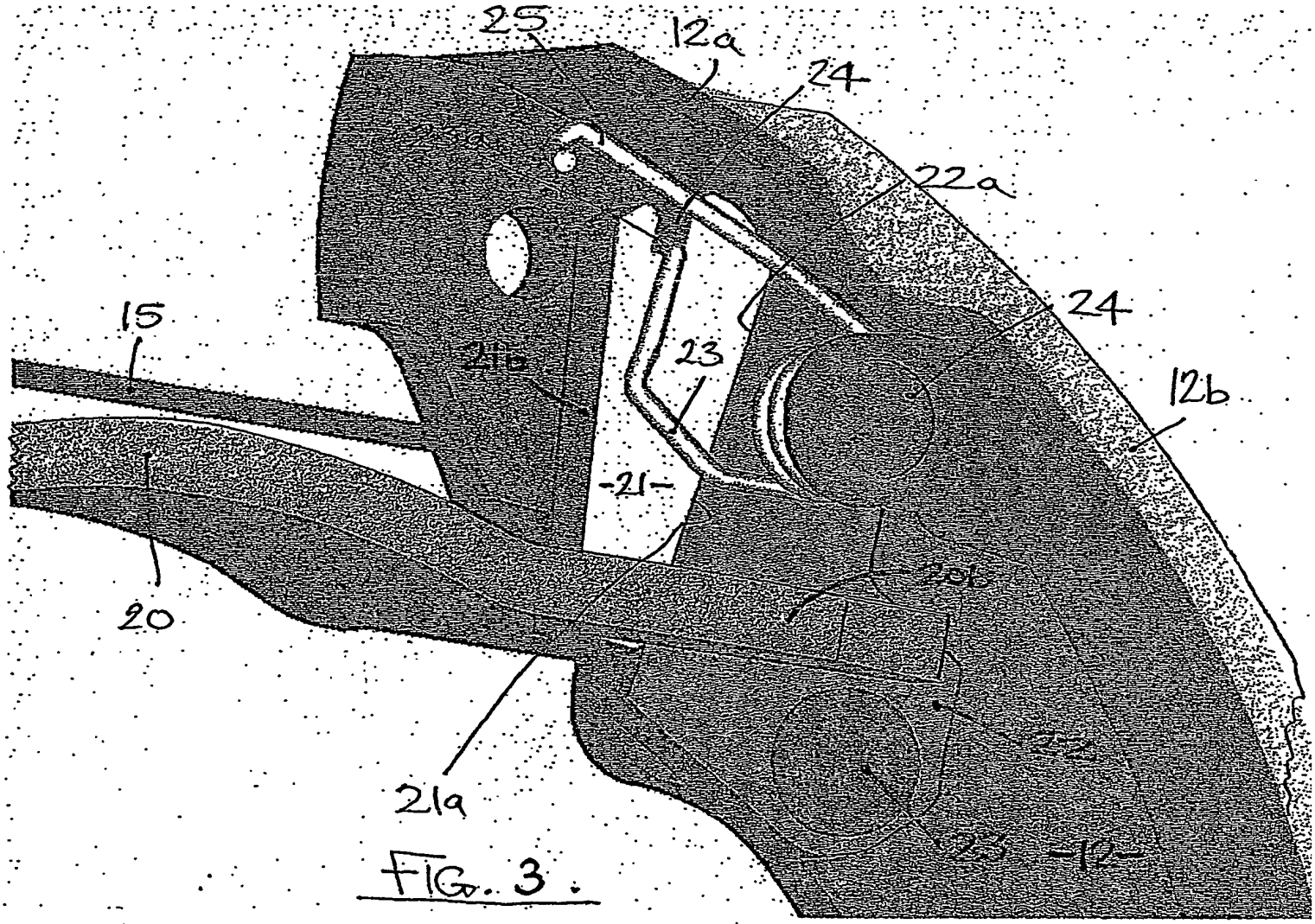
FIG. 2.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15
21b
23
12b
21
20
20b
22
21a
23
12

FIG. 3.

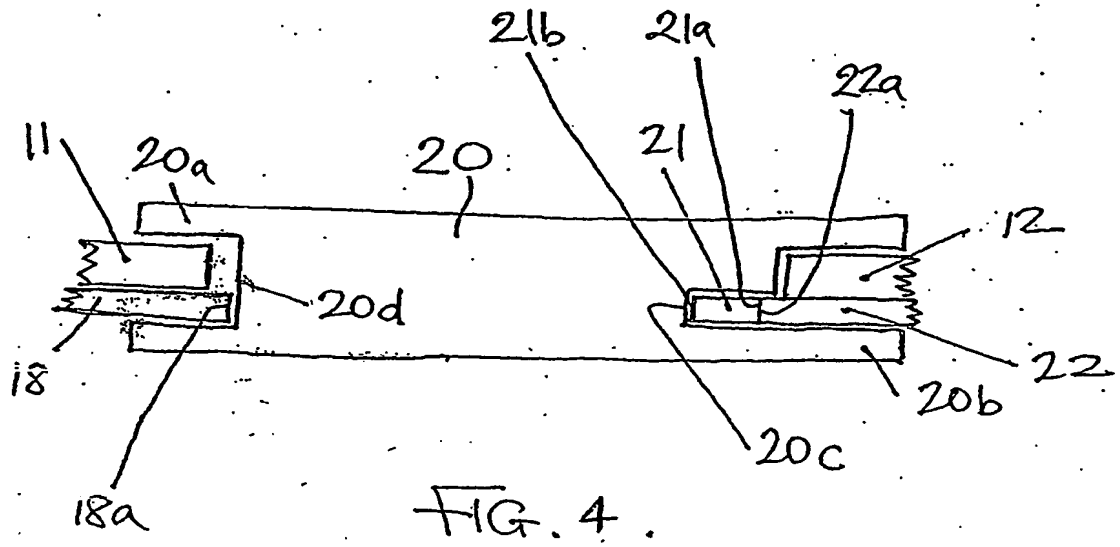

21b
21a
22a
11
20a
20
21
12
20d
18
22
20b
20c
18a

FIG. 4.

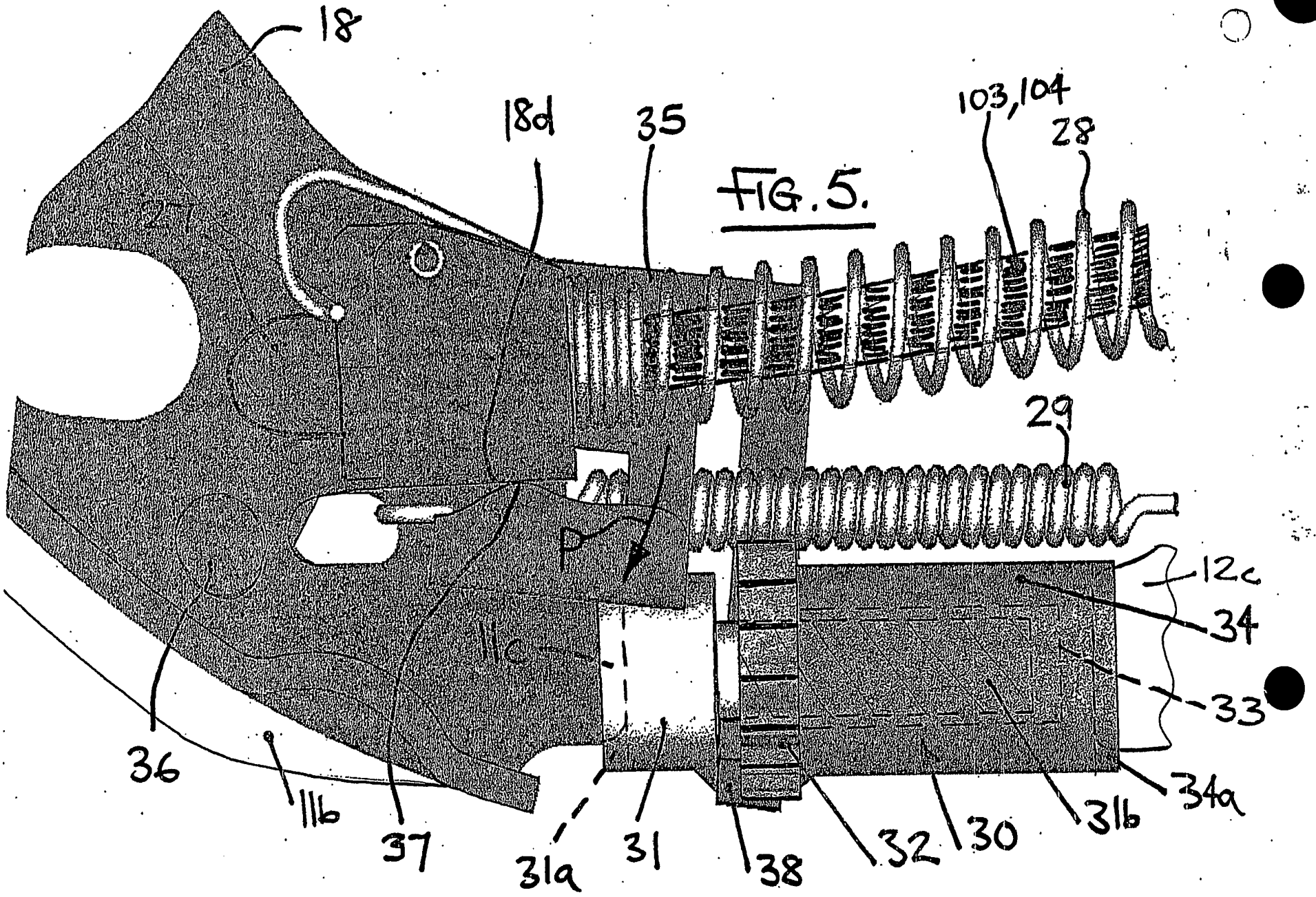

18
18d
35
103,104
28
29
12c
34
33
34a
36
11b
37
31a
31
38
32
30
31b
11c
P

FIG. 5.

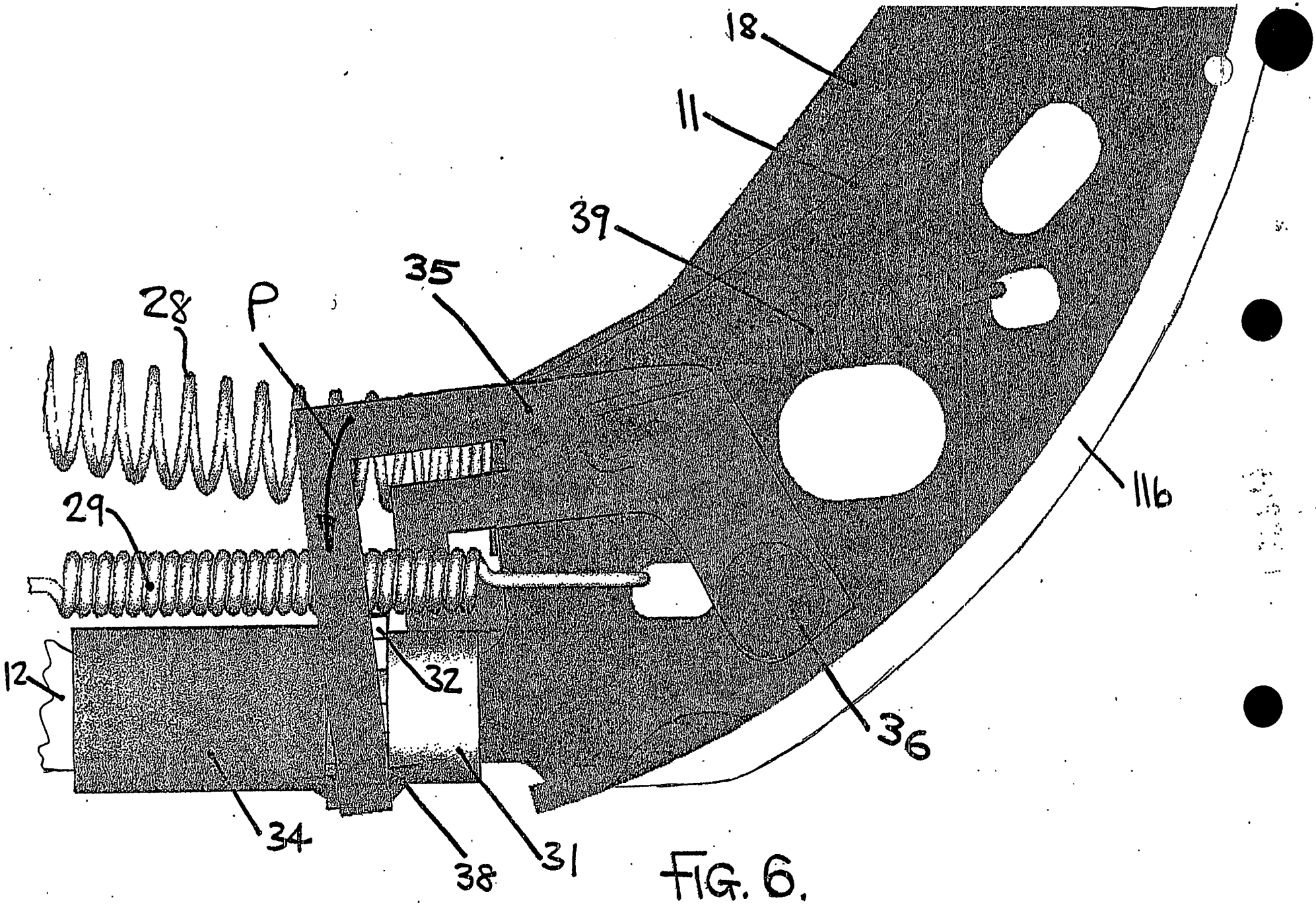


FIG. 6.

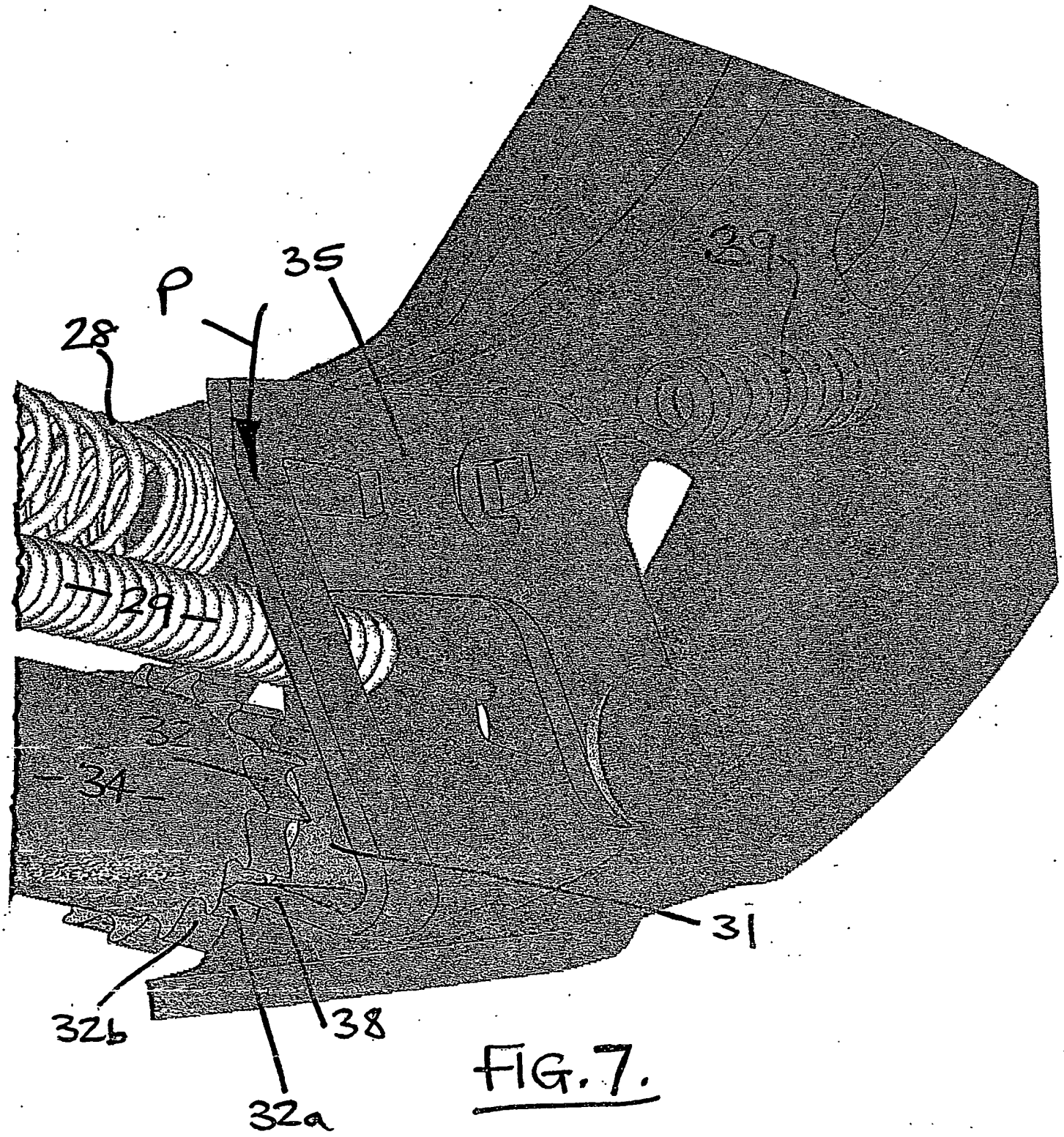


FIG. 7.

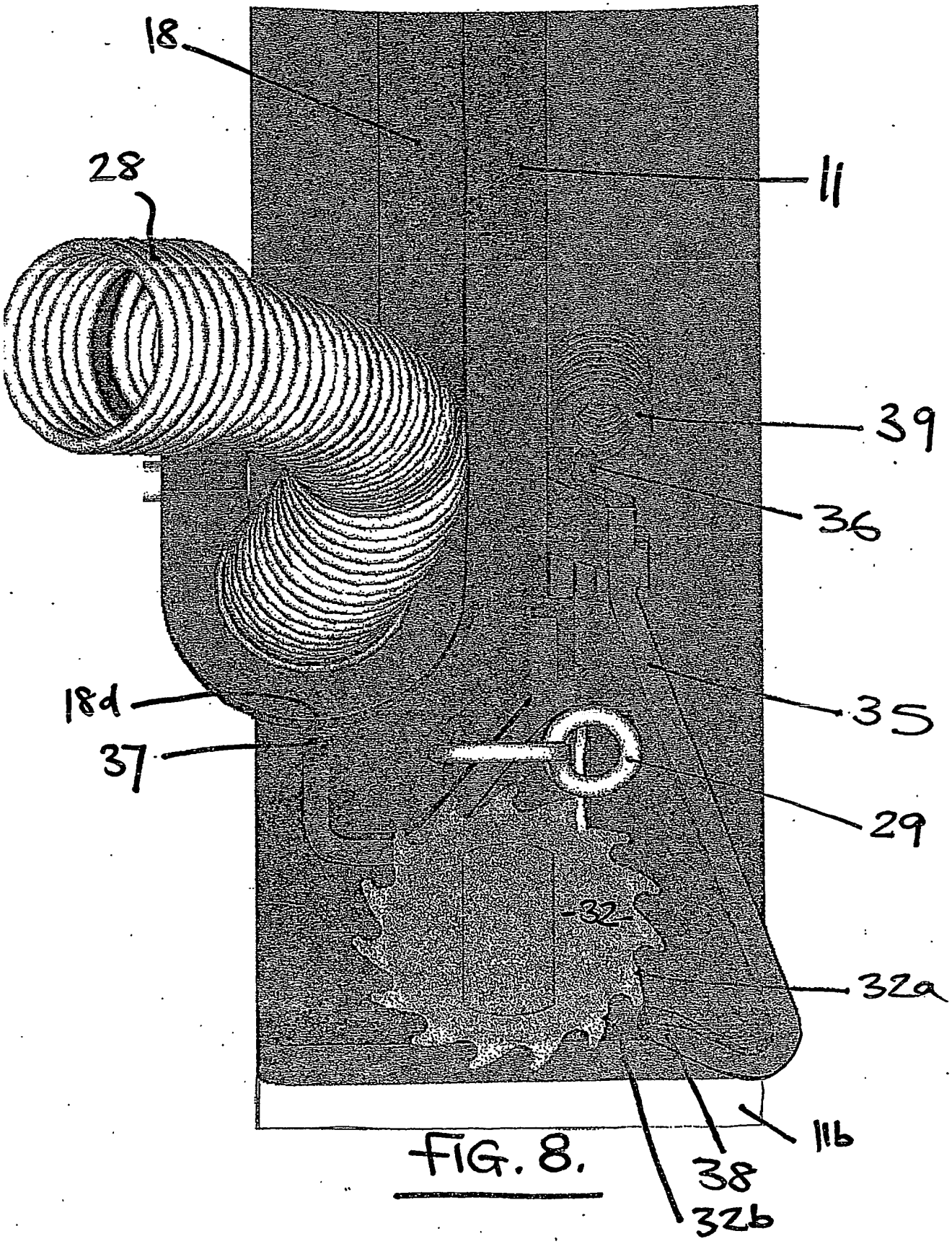
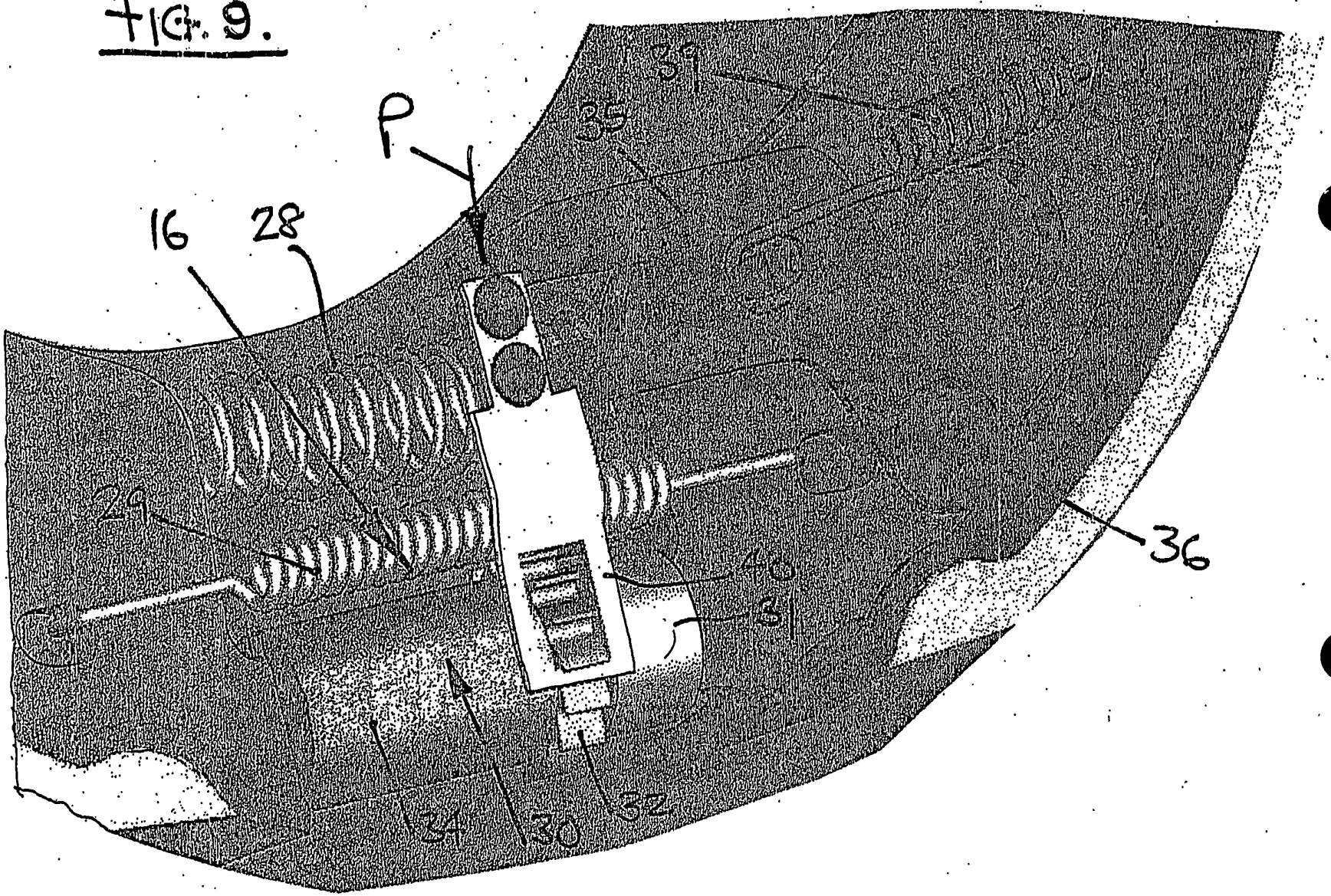


FIG. 8.

Fig. 9.



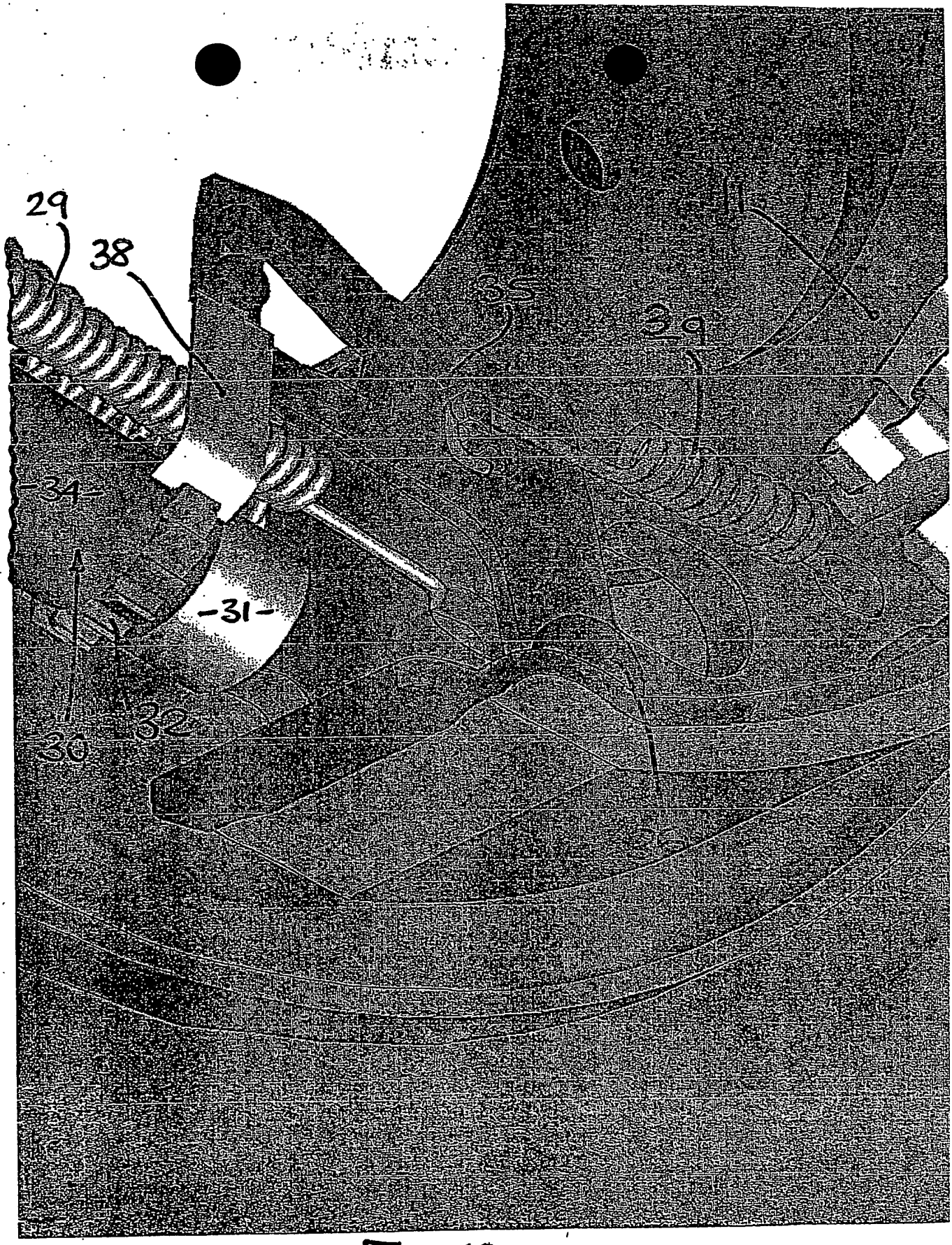


FIG.10.

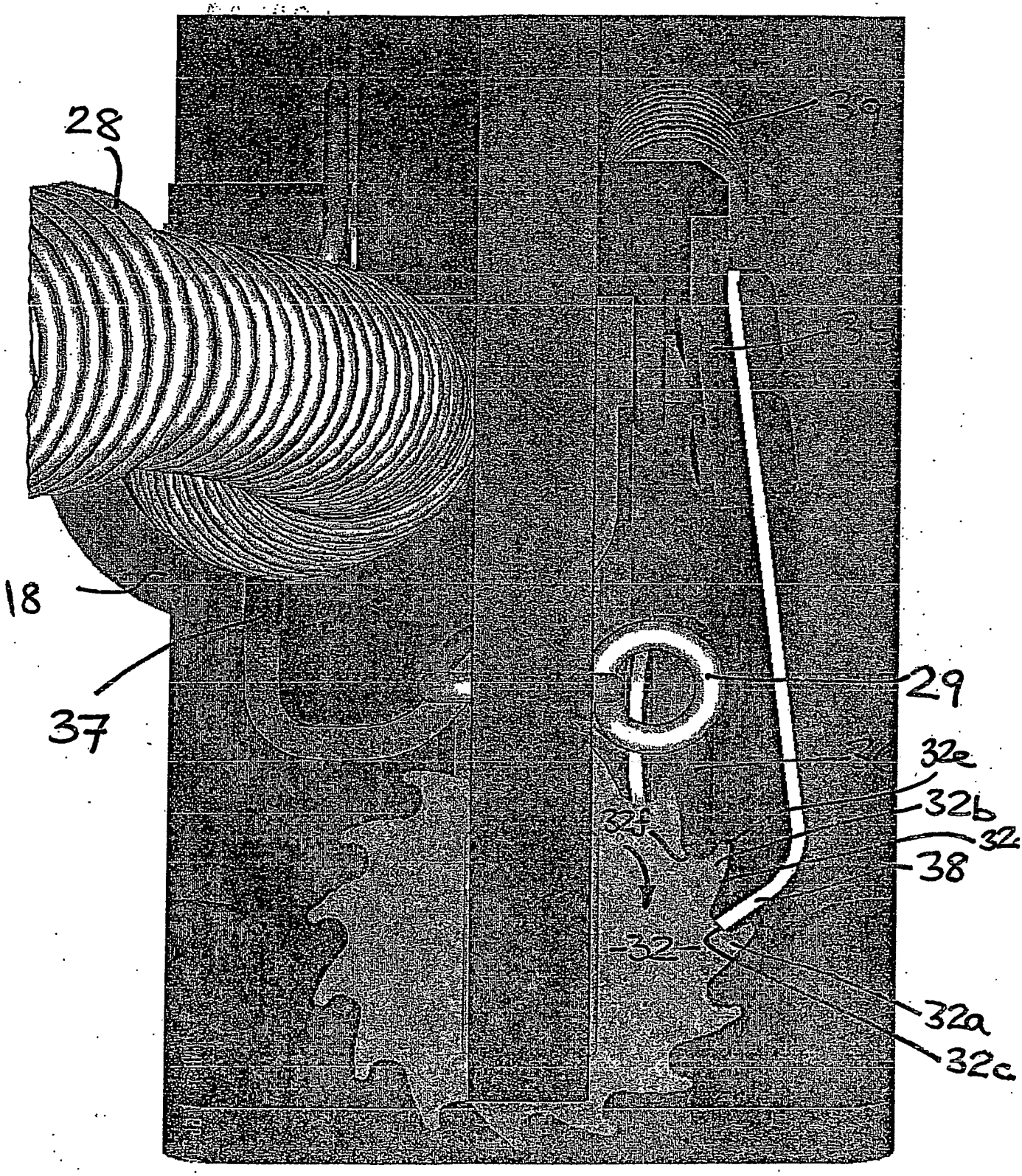


FIG. 11.

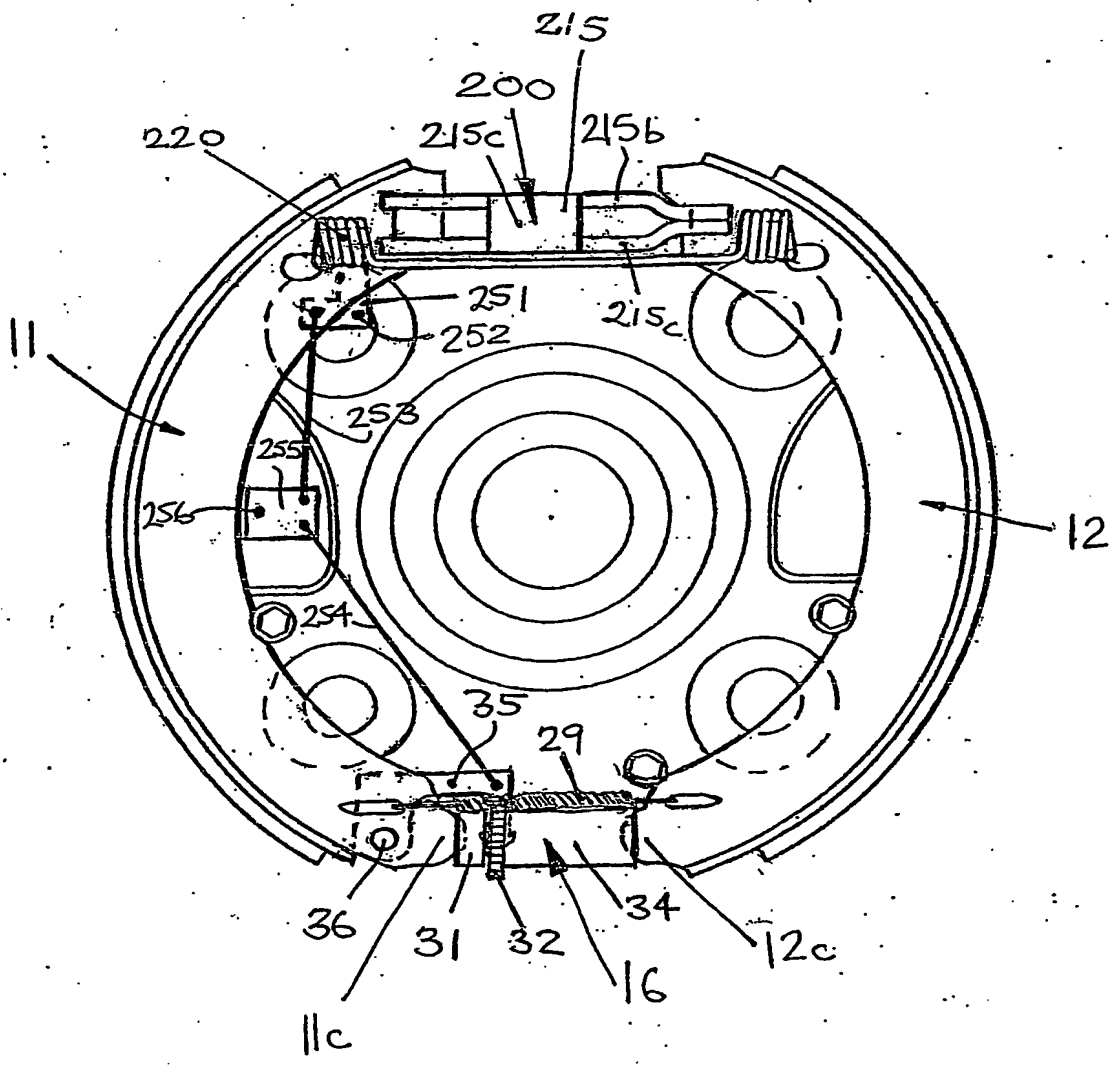

215
200
220
215c
215b
251
252
215c
11
253
255
256
12
254
35
29
36
31
32
34
12c
16
11c

FIG. 12

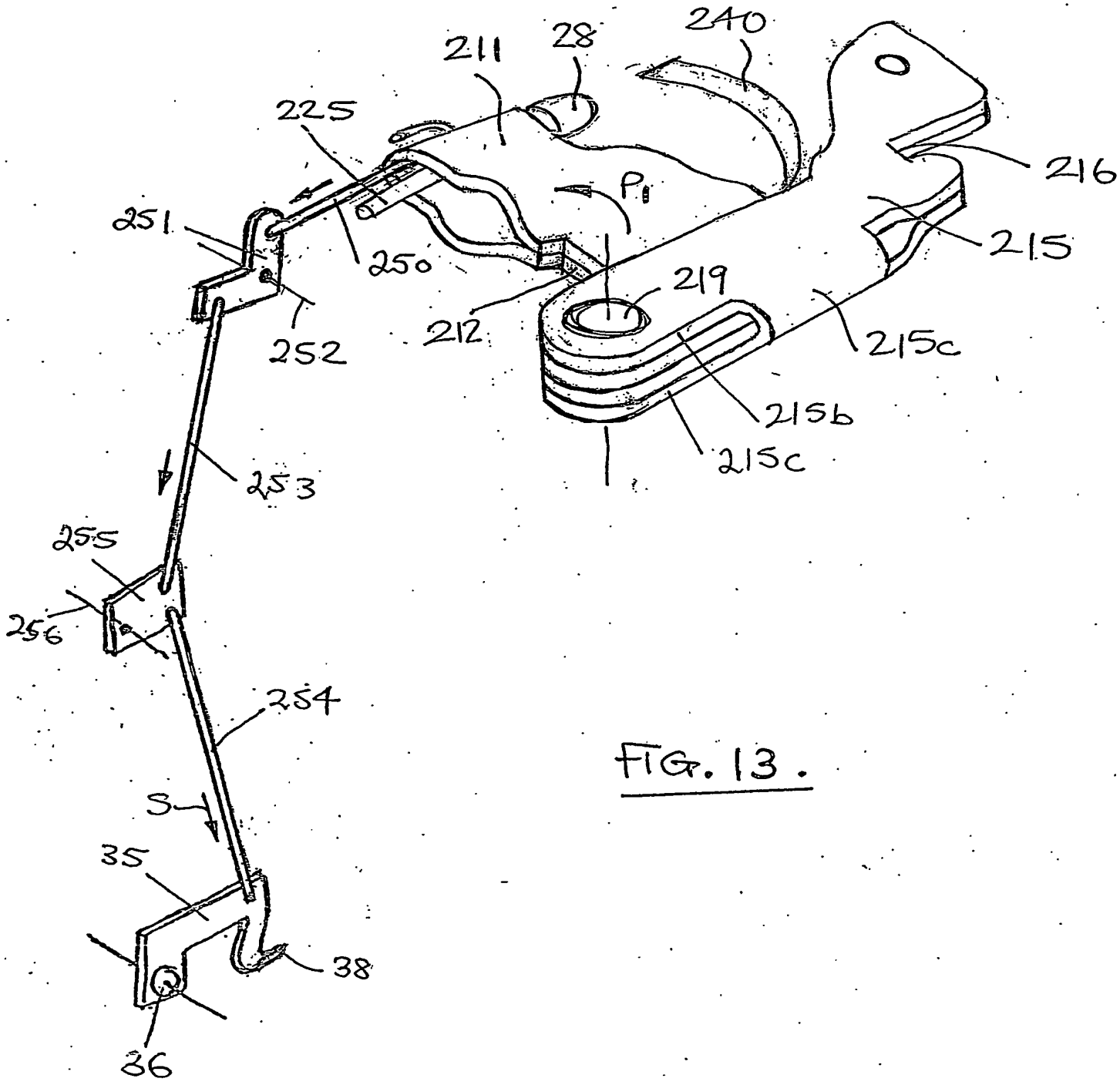

211
28
240
225
216
P1
251
250
215
219
212
252
215c
215b
253
215c
255
256
254
S
35
38
36

FIG. 13.

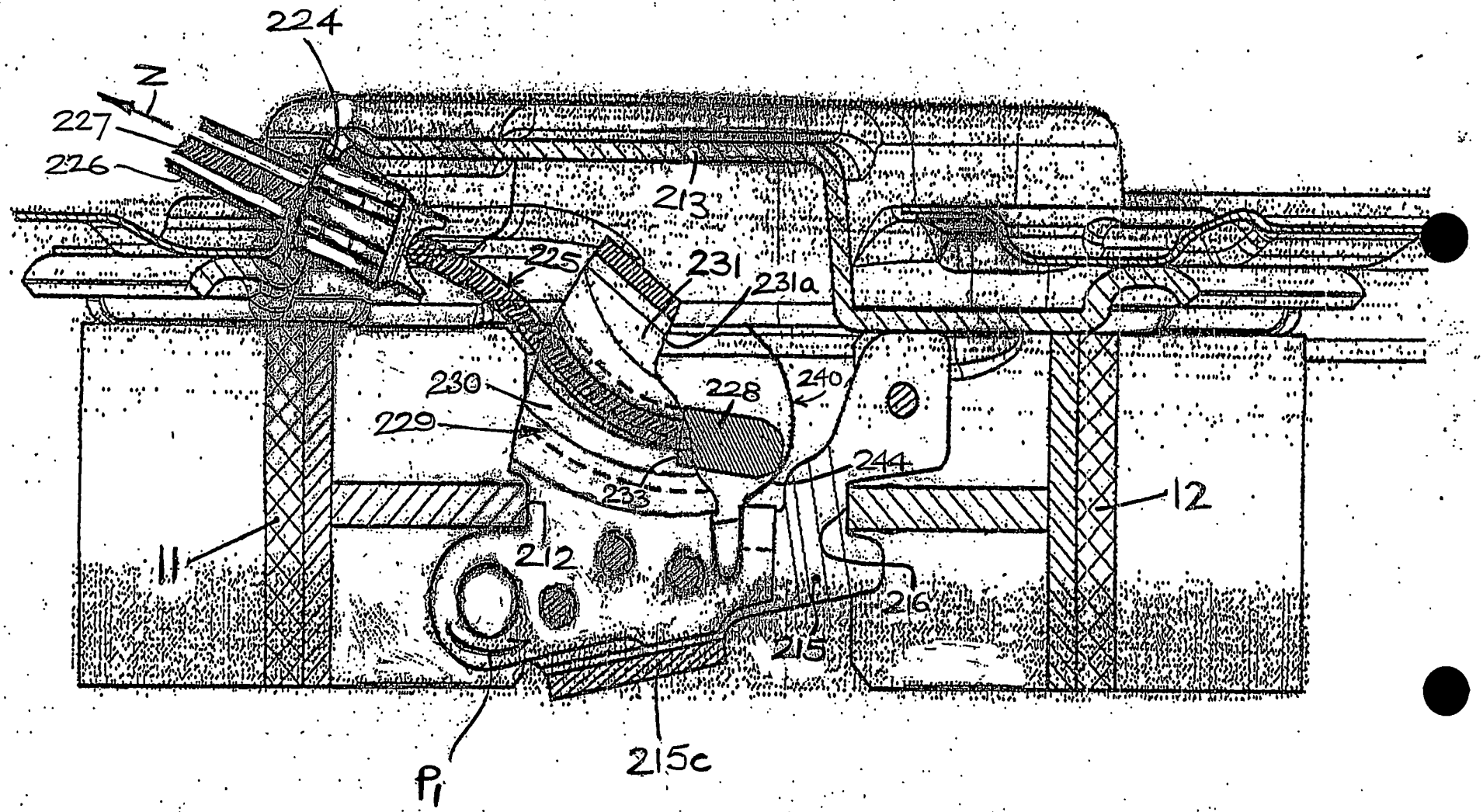

224
Z
227
226
213
225
231
231a
230
228
240
229
244
233
12
11
212
216
215
P1
215c

FIG. 14.

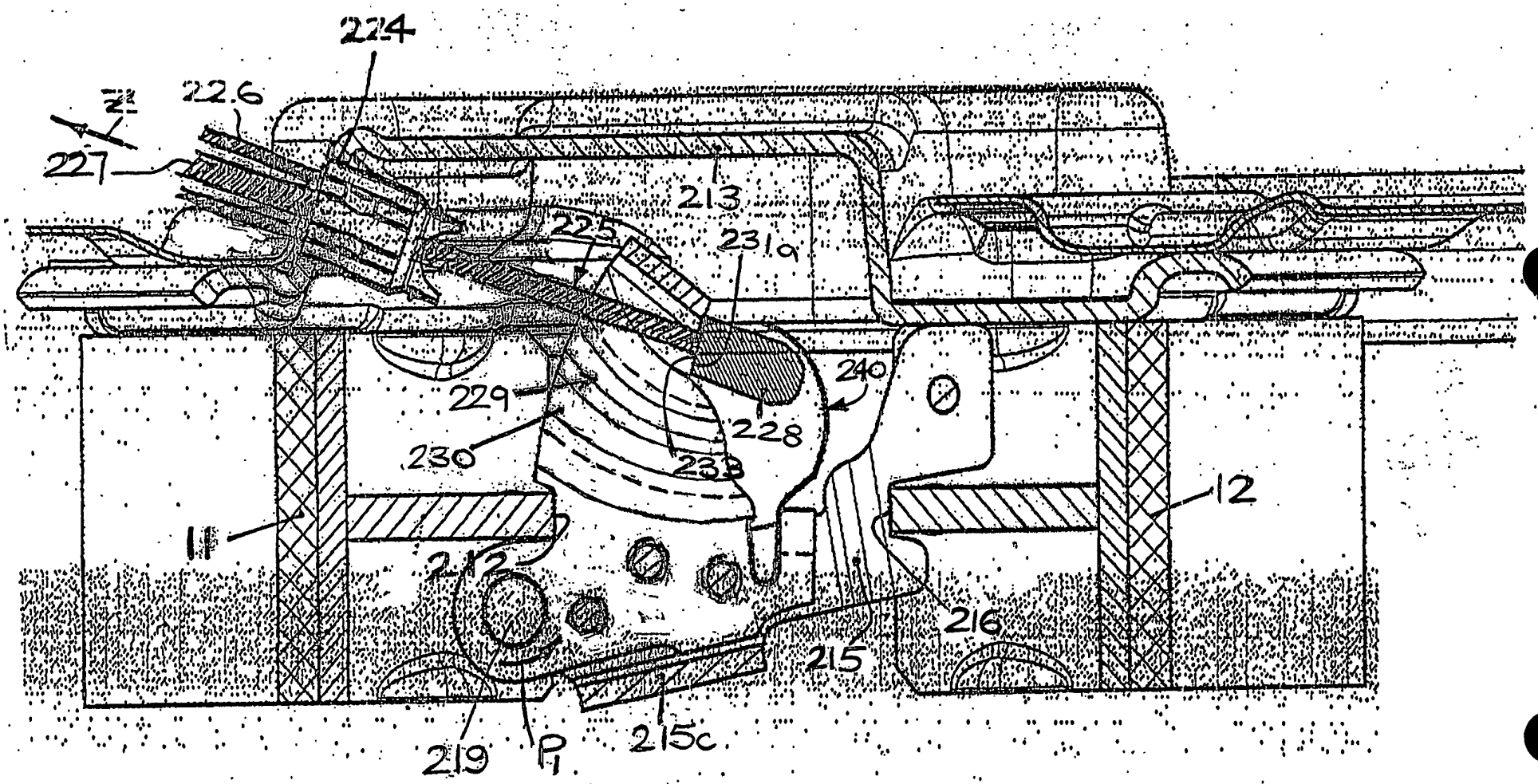

224
226
227
213
225
231a
240
229
228
230
233
12
11
212
216
215
219
P1
215c

FIG. 15.

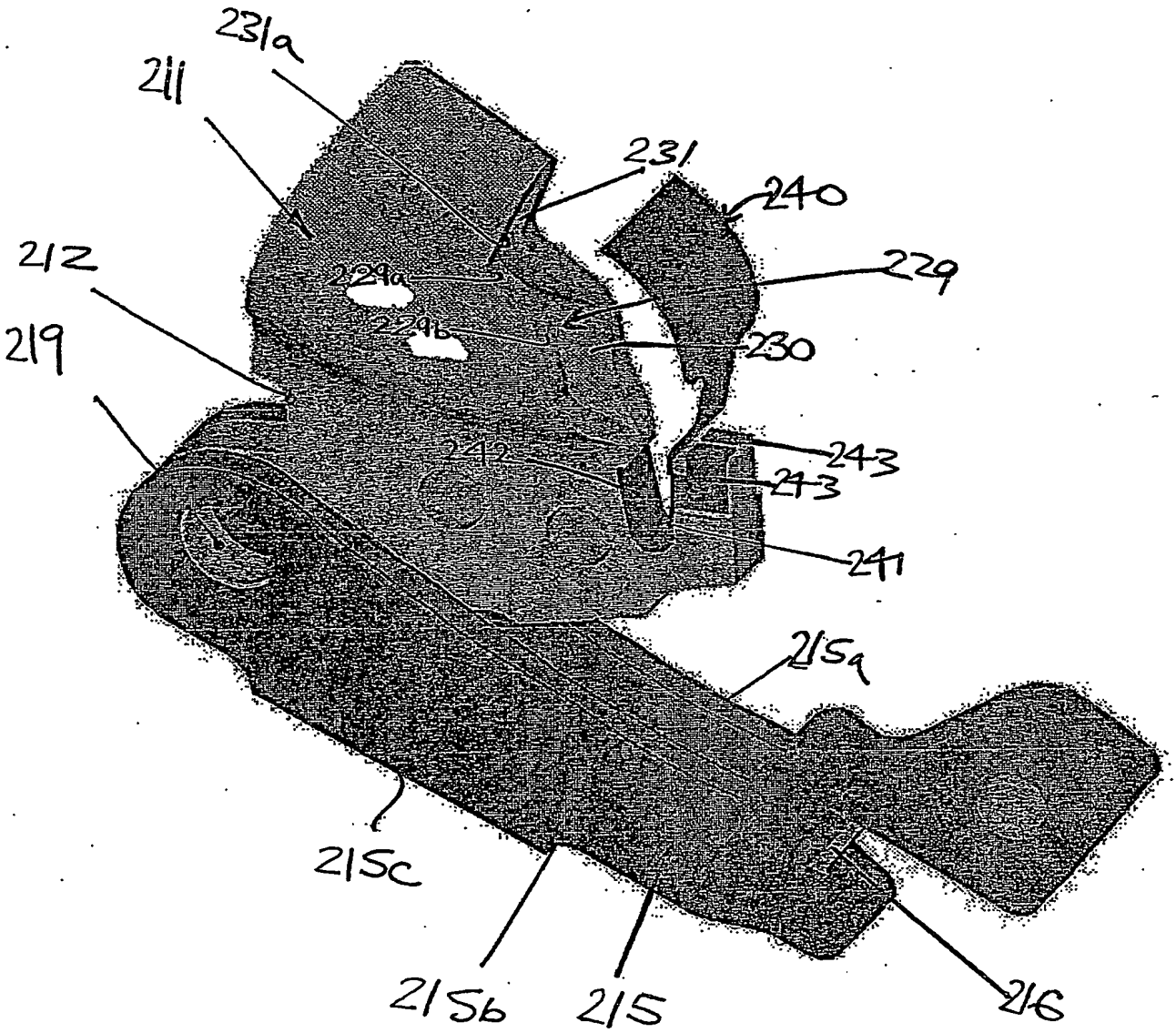

231a
211
231
240
212
229
229a
229b
230
219
242
243
243
241
215a
215c
215b
215
216

FIG. 16.

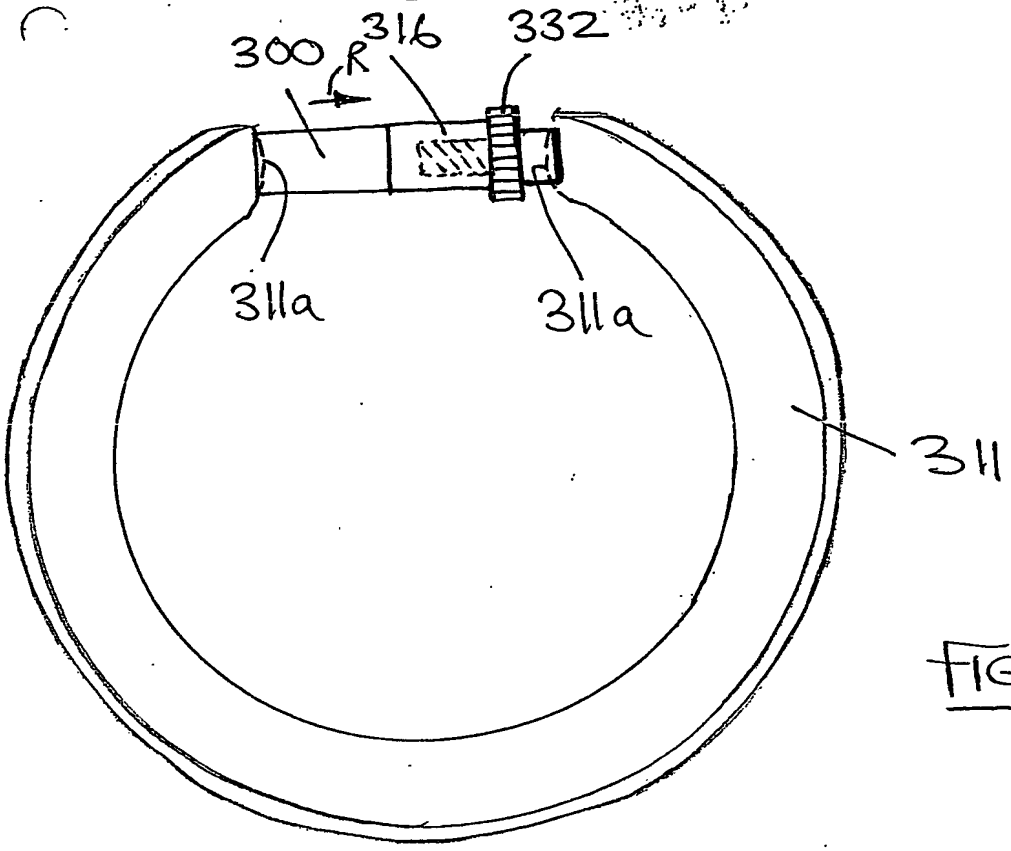


FIG. 17

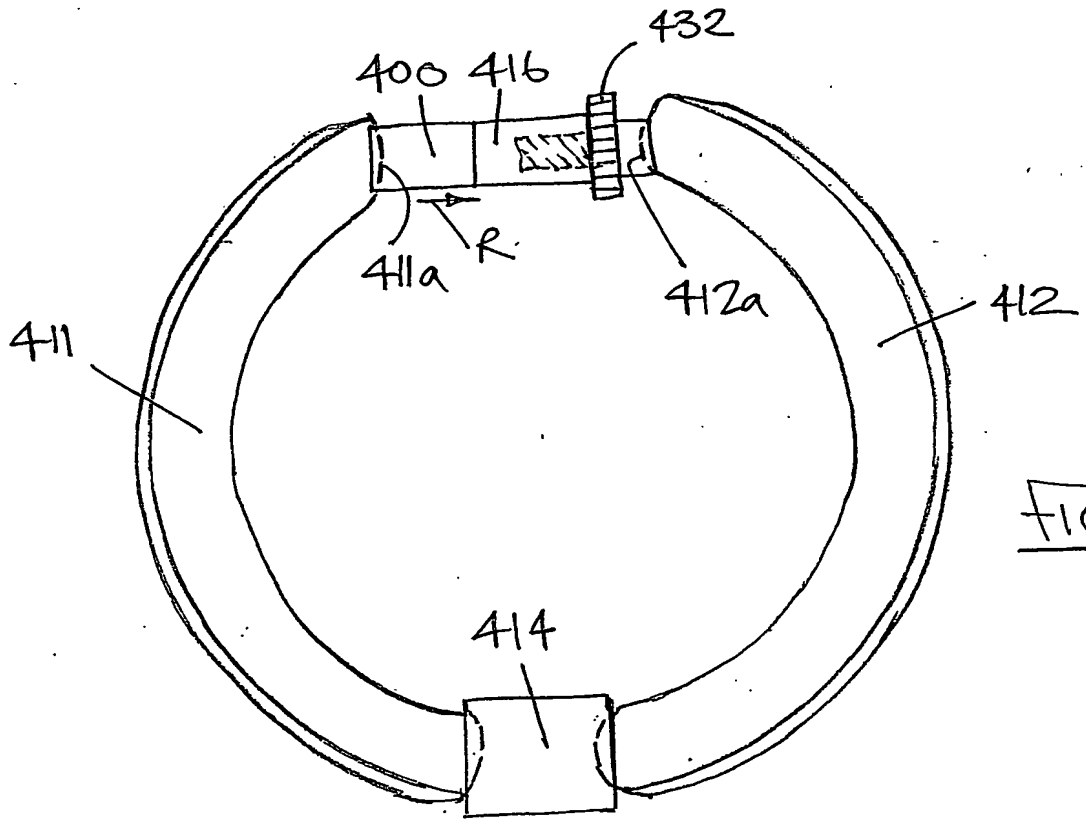


FIG. 18